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(54) # TELESCOPIC SHAFT FOR STEERING COLUMNS IN AUTOMOBILES WITH A SLIDING LOAD CONTROL SYSTEM

(57) Due to the provision of grooves (13) in the inner and outer (10 and 11) surfaces of the grooves (13) and the strips (15) and by combining the strips (16) with the grooves (17), both parts (10 and 11) can slide longitudinally relative to one another. In order to prevent play and to be able to absorb any possible play between the female tubular member (10) and the male tubular member (11), adjustment elements (24) are provided, which are formed by a substantially prismatic longitudinal body, the lugs (26) being mounted on the vertex of said body as shown in Figure.

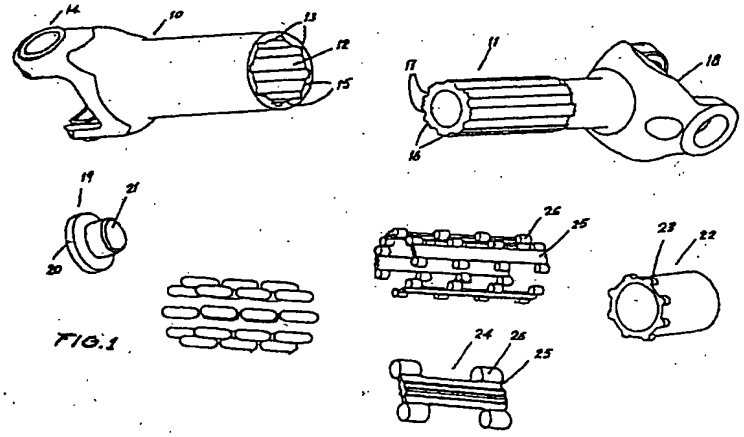

FIG. 1

Description

[0001] The invention refers to a sliding control system with loading control for telescopic shafts to be used in steering columns in motor vehicles. Such telescopic shafts comprise a female member and a male member in the form of tube pieces inserted one within the other. They are provided, at the interface thereof, that is to say the male member inner lateral surface and the female member outer lateral surface, with a number of ribs and longitudinal grooves that mutually engage enabling the rotation of all the mentioned pieces.

[0002] The present invention relates to those telescopic systems undergoing longitudinal displacement of one member relative to the another (displacement of the male member relative to the female member), under controllable load conditions which can take place either on actuating the telescopic regulation mechanism when steering wheel height with regard to the driver is desired to be changed or when it is desired to facilitate assembly on the motor vehicle, or finally the shock that the steering system suffers on proving its performance as a security system for the vehicle to which it is fitted.

[0003] In order to meet the previous requirements and technical conditions it has been designed that between said male member inner lateral surface and said female member outer lateral surface, both members are provided with longitudinal grooves on the lateral surface thereof. There is also provided a group of rollers fastened through the corresponding sleeves according to the above mentioned technical requirements and operation features.

[0004] The system of the present invention provides the above mentioned loading control action at the same time it facilitates taking-up of play between the male and the female members. Furthermore, the relative movement between these members or the adjusted load value that is causing it, will be affected by torque created by rotation to which said male member and female member are subjected.

[0005] The invention provides that stress which is necessary for the relative displacement between the two parts of the telescopic shaft is kept constant for any application (as in patents n° 9202654, 9300654, 9500177 and 9600871 in the name of the same applicant) and along all the displacement path in such a way that the assembly is provided with a certain braking or damping performance to the applied load.

[0006] Although the system of the invention has been devised to be used in a direct way, specifically in the steering columns in motor vehicles it is possible to be fitted in other applications due to its simplicity and easy operation.

[0007] Regarding the possibility that the system of the invention can be used as a security system for the motor vehicle, this is made possible by the particularity of that system of being able to have a braking or damping performance, either in the extended or in the retracted condition, absorbing the energy liberated in the event of crash, further keeping constant the necessary stress for relative displacement between the members in the telescopic shaft along the displacement path.

[0008] In addition, the present invention also provides the possibility to facilitate the correction of the play that usually appears between different tube pieces in the telescopic shafts, thus avoiding the undesirable play producing noise and vibration on running the vehicle. Transferring noise and vibration to the steering wheel and therefore to the user is also avoided as well as it provides a perfect assembly operation.

[0009] On the other hand, the conceptual mechanism that is provided takes into consideration the significance of torque which should be applied for rotation of the whole telescopic shaft on the previously mentioned sliding load between the two members with relative displacement. Such mechanism allows to separate, almost completely, this torque from the longitudinal action of the movement caused by the axial load, so that the effect caused by this torque becomes minimum.

[0010] The present invention heightens the easiness of assembling. Assembling is carried out by using few auxiliary and accessory elements and, in any case, its great assembling simplicity does not involve that weight and costs become significantly increased as compared to the advantages of the system itself.

[0011] Another object of the present invention is to provide a loading control system which is suitable to adjust the stress during the relative displacement between the parts of the telescopic shaft of the steering column. The invention further allows for a good development of the movement by integrally joining all the live parts to one another minimizing the play as well as the influence of the torque related to rotation. It further provides an effective mechanical arrangement which is also simple and cost effective.

[0012] Further details and features of the present patent application will be apparent from the following description, which refers to the accompanying drawings that schematically represent the preferred details. These details are given by way of example, which refer to a possible case of practical embodiment, but it is not limited to the details disclosed herein; therefore this description must be considered from an illustrating point of view and without any type of limitations.

[0013] A detailed list of the various parts cited in the present patent application is given below: (10) female tube member, (11) male tube member, (12) mouth, (13) longitudinal grooves, (14) fork, (15) longitudinal protrusion, (16) longitudinal protrusion, (17) longitudinal grooves, (18) fork, (19) regulator, (20) head, (21) cylindrical portion, (22) closure, (23) ridges, (24) adjusting element, (25) body, (26) stump, (27) rollers, (28) sleeve.

[0014] Figure n° 1 is a perspective of an exploded view in which the main parts in the system of the present invention are shown.

[0015] The figure n° 2 is perspective view of the assembly, which also corresponds to the same example of the telescopic shaft, in which the most significant parts are shown separated with the purpose of clarifying in more degree the actual condition thereof.

[0016] The figure n° 3 is an elevational end view showing a longitudinal section of the telescopic shaft assembly once it has been assembled, wherein the final condition of all the parts is shown.

[0017] In one of the preferred embodiments of what is the object of the present invention, and as it can be seen from figure n° 1, the telescopic shaft comprises a female tube member (10) provided with a fork (14) in one of the ends thereof. The lateral surface of its mouth (12) has a number of longitudinal grooves separated by a number of longitudinal protrusions (15).

[0018] The male tube member (11) has a cylindrical portion one end of which extends forming a fork (18).

[0019] The lateral surface of the male tube member (11) is provided with a regularly distributed longitudinal protrusions (16) arranged between longitudinal grooves (17).

[0020] As the outer lateral surface of the female member (10) and the inner lateral surface of the male member (11) are both provided with longitudinal grooves in the longitudinal protrusions (15) in conjunction with the longitudinal protrusions (16) and the longitudinal grooves (17), relative longitudinal sliding between both pieces (10) and (11) is thus possible.

[0021] Adjusting elements (24) are designed for the purpose of avoiding and absorbing play that could exist between the female tube member (10) and the male tube member (11). As it can be seen from figure n° 1, adjusting elements (24) comprise a substantially prismatic longitudinal body at the vertexes of which there are provided stumps (26).

[0022] Adjusting elements (24) which can be made of plastic or another similar material are designed to allow fastening of the rollers (27) which can be made of specular finished hard steel with the purpose of enabling relative rotation between the members (10) and (11) in a way as easy as possible.

[0023] This adjusting element (24) allows absorption of play that could exist between the members (10) and (11), by torque of rotation which occurs during the normal operation of the whole assembly of the telescopic shaft since it can be self aligned to be adapted, during rotation, to the corresponding grooves and ribs, both in the female member (10) and the male member (12), on which it is seated, serving as an intermediate piece therebetween.

[0024] On the other hand, to adjust rotation and sliding it has been devised a regulator (19), see figure n° 1, which comprises a substantially cylindrical head (20) extending in another cylindrical portion (21) having a smaller diameter. Said regulator is housed in the male member (11) sliding end and it serves the purpose of forcing the preload or folding or sagging condition of the element (24) in such a way that sliding between members (10) and (11) is performed in a controlled way, through the friction load caused by the adjusting element (24) in its contact with the female member (11) under the stress created by the preset load.

[0025] To enable the above mentioned preload, caused by the regulation system achieved by regulator (19) on the adjusting element (24), the piece (22) acts as a closure opposed to regulator (19) and seated on the male member (11). Therefore, its length allows it to be supported at one of its end by the fork and by the plastic sleeve for the other end.

[0026] Also in the figure n° 1 the possibility is detailed that the sleeve or adjusting element (24) can be formed in turn by simple elements (24-25-26), the combination of which can provide the assembly the most appropriate form in each possible case further enabling the different functions to be assigned to this element (24):

- Accurately having the ability of an appropriate fastening of the rollers (27), which can vary in number, form and size according to each of the previously mentioned cases. Rotation transmission between the male member (11) and the female member (10) is carried out without any problem, both relating to movement effectiveness and regarding noise and vibration decreasing. Therefore, all possible metallic contact is avoided between the different pieces.
- Having the necessary and required friction load with the male member (11) and female member (10) by means of the elastic folding itself originated by the preload applied through regulation supplied by the regulator (19).
- Avoiding presence of play between the female member (10) and the male member (11), by appropriately seating of the elastic teeth in each of the elements of the adjusting element (24). They are engaged to the longitudinal grooves and the longitudinal protrusions provided therein. Said elements are adjusted in all cases and in accordance with the degree of torque that is applied thereon.

[0027] All the above mentioned is carried out by the inherent elasticity of the material of the adjusting element (24) which enables the system to be formed by the male member (11), the female member (10) and the adjusting element (24) along with the rollers (27), giving rise to an unit which is rigidly formed, as it can be deduced when observing figure n° 2.

[0028] On the other hand, in figure n° 3 an assembly of the different pieces forming the telescopic shaft in its corresponding position, once assembly has been terminated, is shown. In such position, shaft is ready to operation in an effective way, during the operation of the assembly. There is also a further part: the retaining sleeve (8). It serves the purpose of closing the whole assembly thus preventing assembly from being taken

apart, mainly between the two tube members (10) and (11) at the same time it could operate as a shutter for the existing lubricant grease between the sliding pieces.

[0029] As it can be seen from figure n° 3, sleeve (28), which serves the purpose of closing the whole assembly, prevents the assembly from being taken apart, mainly between the two tubular members, the male member (11) and the female member (10). If further serves as a shutter for the existing lubricant grease between the above mentioned sliding pieces.

[0030] As it can be observed in figure n° 3, this sleeve (28) can be arranged laterally fixed, as shown in figure n° 3, axially or in any other suitable way, to the female tube member (10), either by a press-fit assembly, with a certain number of pressure notches, as shown in the present embodiment, or by other ancillary fixing elements. It is also envisaged that the sleeve is removable.

[0031] Although the different pieces in the system could be made of any material, according to the type of application where it will be used, elements (24), (22) and (28) will be mainly designed so that they fulfil in a appropriate way the functions that they have assigned. They also cooperate for the whole assembly to be as light and cheap as possible.

[0032] Once the invention has been sufficiently described in accordance to the enclosed drawings, it is understood that any modification can be introduced as appropriate, provided that variations may alter the essence of the invention as summarised in the appended claims.

Claims

1. "TELESCOPIC SHAFT FOR STEERING COLUMNS IN MOTOR VEHICLES WITH LOADING CONTROL SLIDING SYSTEM" comprising a female tube member (10) having a substantially cylindrical configuration in one end of which there is provided a fork (14) having a lateral surface which is provided with a mouth (12), longitudinal grooves (13) and longitudinal protrusions (15) being formed in said lateral surface forming a number of ribs fitted in those formed in a male member (11) in one end of which there being provided a fork (18), the lateral surface of said male member (11) being provided with a number of longitudinal protrusions (16) and longitudinal grooves (17) forming a number of ribs fitted in those formed in said the female member (10) when said male member (11) is introduced within said female member (10), characterized in that between the lateral inner surface of the female member (10) and the lateral outer surface of the male member (11) there is provided an adjusting element (24) which comprises a substantially prismatic, longitudinal body (25) which minor bases are provided with a number of cylindrical stumps (26) distributed at regular distances between which substantially cylindrical rollers (27) are arranged.

2. "TELESCOPIC SHAFT FOR STEERING COLUMNS IN MOTOR VEHICLES WITH LOADING CONTROL SLIDING SYSTEM" according to the preceding claim, characterized in that it comprises an adjustment assembly (28) having a plurality of adjusting elements (24) comprising a generally prismatic body provided in the vicinity of the ends thereof by cylindrical stumps (26).

3. "TELESCOPIC SHAFT FOR STEERING COLUMNS IN MOTOR VEHICLES WITH LOADING CONTROL SLIDING SYSTEM" according to the preceding claims, characterized in that the adjusting element (24) is made of plastic or another suitable material, the stumps (26) of said adjusting element (24) holding rollers (27) made of specular finished hard steel.

4. "TELESCOPIC SHAFT FOR STEERING COLUMNS IN MOTOR VEHICLES WITH LOADING CONTROL SLIDING SYSTEM" according to the preceding claims, characterized in that rotation and sliding of the male member (11) relative to the female member (10) is limited by a regulator (19) housed in the male member sliding end (11), said regulator (19) comprising a head (20) extending in a smaller diameter cylindrical portion (21).

5. "TELESCOPIC SHAFT FOR STEERING COLUMNS IN MOTOR VEHICLES WITH LOADING CONTROL SLIDING SYSTEM" according to the preceding claims, characterized in that regulator (19) controls sliding between the members (10) and (11) as well as the friction load caused by the adjustment assembly (28) in the contact thereof with the female member (10) under stress created by the preset load.

6. "TELESCOPIC SHAFT FOR STEERING COLUMNS IN MOTOR VEHICLES WITH LOADING CONTROL SLIDING SYSTEM" according to the preceding claims, characterized in that the adjustment assembly (28) which acts as a closure is fitted in the male member end (10) seated on the lateral surface of the male member (11).

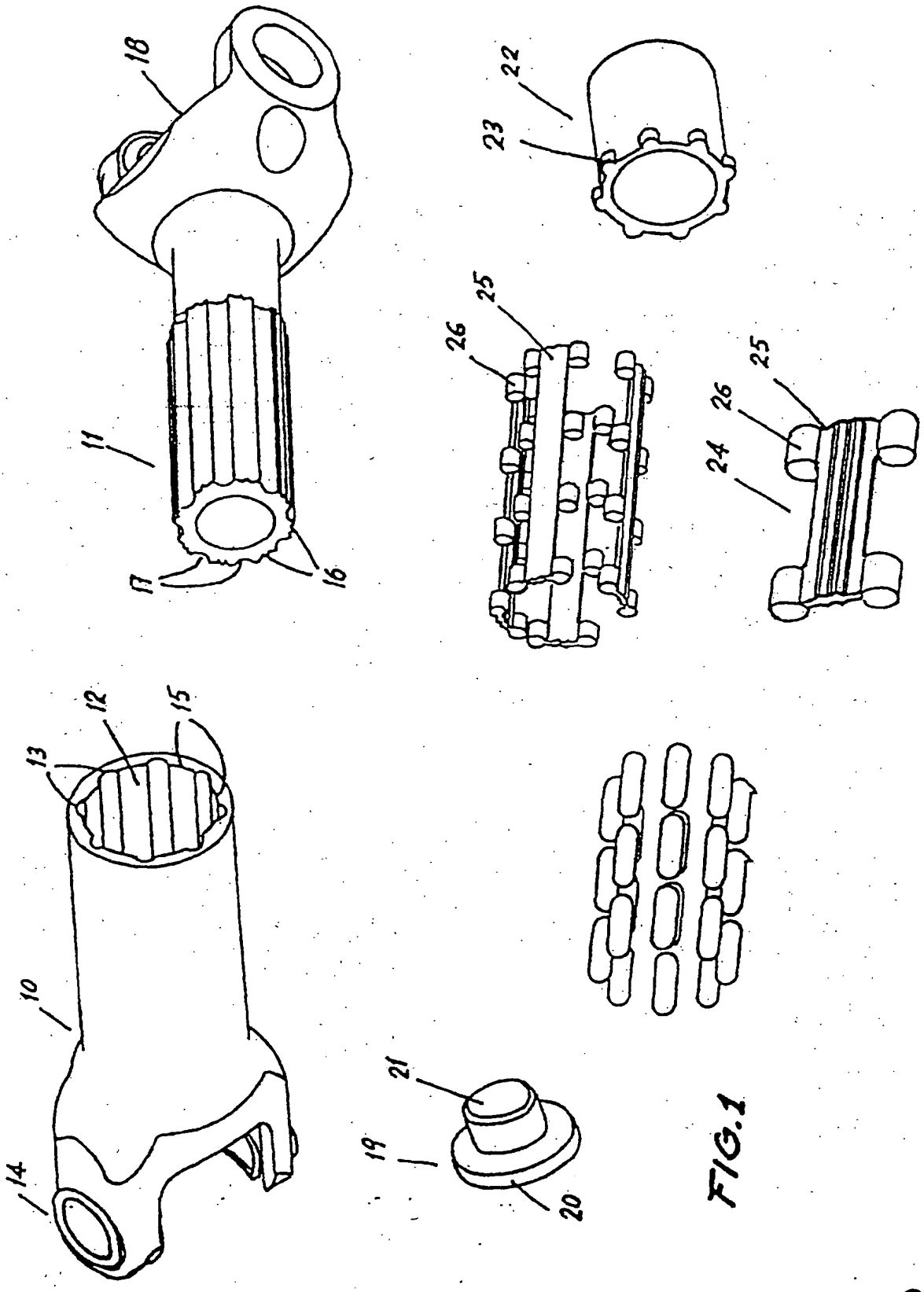

FIG.1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES 00/00015

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 : B62D 1/19;B62D 1/18; F16D 3/06; F16C3/03
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 : B62D; F16D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
CIBEPAT, MODINDU, EPODOC,PAJ,WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5709605 A (RIEFE et al) 20 January 1998 (20.01.98) The whole document	1
A	FR 1597341 A (SOCIETE DES AUTOMOTIBILES SIMCA) 31 July 1970 (31.07.70) The whole document	1
A	US 5460574 A (HOBAUGH) 24 October 1995 (24.10.95) The whole document	1
A	DE 3730393 A (LEMFÖRDER METALLWAREN) 23 March 1989 (23.03.89) Abstract, figures	1
A	US 5413417 A (LABEDAN) 09 May 1995 (09.05.95) The whole document	1
A	US 4667530 A (METTLER et al) 26 May 1987 (26.05.87) The whole document	1

☐ Further documents are listed in the continuation of box C. ☒ Patent family members are listed in annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 April 2000 (18.04.00)	24 April 2000 (24.04.00)
Name and mailing address of the ISA/ S.P.T.O	Authorized officer Telephone No.

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